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IMPLEMENTATION PLAN REVIEW FOR IOWA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

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IMPLEMENTATION PLAN REVIEW

FOR

IOWA

AS REQUIRED

BY

THE ENERGY SUPPLY

AND

ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

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16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interferring with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

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FOR
IOWA
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PREPARED BY THE FOLLOWING TASK FORCE:

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(Contract 68-02-1385)

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1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the State on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIP's, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage States to either defer compliance regulations or to revise the SO_2 emission regulations. The States have also been asked to discourage large scale shifts from coal to oil in cases where such shifts are not required for the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those States with the largest clean fuels saving potential. Several of these States have or are currently in the process of revising SO_2 regulations. These States are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are: 1) The use of the example region approach in developing Statewide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many State plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the State if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For instance, a control strategy based on a particular region or sources can result in a regulation requiring one percent sulfur oil to be burned state-wide where the use of three percent sulfur coal would be adequate to attain NAAQS in some locations

EPA anticipates that a number of States will use the review findings to assist them in making the decision whether or not to revise portions of their State Implementation Plans. However, it is most important for those States which desire to submit a revised plan to recognize the review's limitations. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the report's findings are based is the most currently available to the Federal Government.* However, EPA believes that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality standards. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that States select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution problems such as sulfates.

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because

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*Except data currently being processed by EPA.

stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

Part of each State's review was organized to provide an analysis of the SO_2 and TPS emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations. In conjunction with the regional analysis, a summary of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, and E.

FINDINGS

- The State Implementation Plan for Iowa has been reviewed for the most prevalent causes for overly restrictive fuel combustion emission limiting regulations. Even though Iowa used the example region approach to develop SO_2 and particulate control strategies, the major findings are:

  FOR PARTICULATES, THERE IS LITTLE INDICATION THAT EXISTING FUEL COMBUSTION EMISSION REGULATIONS ARE OVERLY RESTRICTIVE. FOR SULFUR DIOXIDE, THERE IS A GOOD INDICATION THAT EXISTING FUEL COMBUSTION EMISSION REGULATIONS MAY BE OVERLY RESTRICTIVE. IN FACT, IOWA IS IN THE PROCESS OF REVISING ITS SULFUR DIOXIDE EMISSION LIMITING REGULATION. THIS REVISION IS CONSISTENT WITH THE INTENTIONS OF SECTION IV OF ESECA.

- Reported suspended particulate levels exceed NAAQS in 11 of Iowa's 12 AQCRs. AQCR 091, which shows no NAAQS violations for TSP, has essentially no fuel burning emission sources. AQCR 068, 085, 088 and 092 have been designated as maintenance areas for TSP. The Iowa fuel burning particulate regulation does not appear overly restrictive in the example particulate AQCR 092 (South Central), especially if different fuel practices than occur at present were contemplated. A similar conclusion is reached for AQCR's 085 (Omaha), 086 (Sioux City), and 088 (N.E.). AQCR's 087, 091, 090, and 093 have little clean fuel savings potential based on inventoried fuel sources. The eastern Iowa AQCR's 065, 068, 069, and AQCR 089 (N.C.) show some possibility of fuel burning particulate regulation relaxation if non-fuel sources are scrutinized. Clean fuel savings are possible, however, within existing particulate regulations in AQCR's 065, 069 and 089.

- Limited monitoring data in all Icwa AQCR's shows SO_2 levels to be below NAAQS. All Iowa AQCR's thus would appear to be good candidates for additional SO_2 emissions via fuel switching. No AQMA's for SO_2 have been designated in Iowa. The only available SO_2 modeling result for an Iowa power plant found the Iowa SO_2 regulation to be consistent with NAAQS attainment.

2.0 STATE IMPLEMENTATION PLAN REVIEW

SUMMARY

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the State have air quality standards which are more stringent than NAAQS?
- Does the State have emission limitation regulations for control of (1) power plants, (2) industrial sources, and (3) area sources?
- Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?
- Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there proposed Air Quality Maintenance Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on (1973) air quality data, are there no reported violations of NAAQS?
- Based on (1973) air quality data, are there indications of a tolerance for increasing emissions?
- Are the total emissions from stationary fuel combustion sources proportionally lower than those of other sources?
- Must emission regulations be revised to accomplish significant fuel switching?
- Is there a significant clean fuels savings potential in the region?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations increases when there are affirmative responses to the above.

The initial part of the SIP review report, Section 2 and Appendix A, was organized to provide the background and current situation information for the State Implememtation Plan. Section 3 and the remaining Appendices provide an AQCR analysis which helps establish the overall potential for revising regulations. Emission tolerance estimates have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for revising emission limiting regulations. In conjunction with the regional analysis, a characterization of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, and E. Finally, candidates from Appendix B are examined in Appendix F for adequacy or over-restrictiveness of emission regulations.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. The following table summarizes the State Implementation Plan Review. The remaining portion of the report supports this summary with explanations.

STATE IMPLEMENTATION PLAN REVIEW (SUMMARY) - IOWA

"INDICATORS"	STATE		BURLINGTON KEOKUK AQCR 065		DUBUQUE AQCR 068		QUAD CITIES AQCR 069		OMAHA AQCR 085		SIOUX CITY AQCR 086		SIOUX FALLS AQCR 087		S.E. AQCR 089		N. C. AQCR 089		N.W. AQCR 090		S. E. AQCR 091		S.C. AQCR 092		S.W. AQCR 093	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	No	No																								
• Does the State have emission limiting regulations for control of 1. Power plants 2. Industrial sources 3. Area sources	Yes Yes Yes	Yes Yes No																								
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Yes	Yes																								
• Has the State not initiated act on to modify combustion source emission regulations for fuel savings, i.e., under the Clean Fuels Policy?	No	No																								
• Are there proposed Air Quality Maintenance Areas?			No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	Yes	No	No	No
• Are there indications of a sufficient number[1] of monitoring sites within a region?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Is there an expected 1975 attainment date for NAAQS?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Based on reported (1973) Air Quality Data, does air quality meet NAAQS?			No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes
• Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?			No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes
• Are the total emissions from all primary fuel combustion sources lower than those of other sources?			Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	No[2]	No	No	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?			-	No[3]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
• Must emission regulations be revised to accomplish significant fuel switching?			No[6]	Yes[5]	Yes[6]	No	No[6]	No	No[6]	No	No[6]	No	-[4]	-[4]	Yes[6]	No	No[6]	No	No[6]	-[4]	-[4]	No	Yes[6]	No	Yes[6]	Yes[5]
• Based on the above considerations, what is the potential for revising fuel burning source emission limiting regulations?			Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good	Poor	Good
• Is there a significant Clean Fuels Saving potential in the region			Yes	Yes	No[6]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No[4]	No[4]	Yes	Yes	Yes	Yes	Yes	Yes	No[4]	No[4]	No	Yes	Yes	Yes

[1] Does not reflect SIP monitoring requirements but rather is a judgment of monitoring adequacy relative to emissions.

[2] About 1/2 of inventoried particulate emissions originate from fuel sources in AQCR 092.

[3] Modeling results for Burlington Power Plant in AQCR 065 indicate that SIP regulation is barely adequate for non-violation of NAAQS. No other modeling results were available for Iowa sources.

[4] There are very few fuel emission sources reported in AQCRs 087 and 091.

[5] Power plants in AQCRs 065 and 093 would require regulation change or SO_2 emission control in order to burn additional coal (or continue burning all coal). Industrial sources could burn additional coal without regulation change.

[6] Assumes reported levels of particulate emission controls were to remain constant with fuel switching.

2.1 IOWA AIR QUALITY SETTING

The State of Iowa is divided into 12 Air Quality Control Regions, including six Interstate AQCR's. These are:

1) AQCR 065 - Burlington Keokuk Interstate (Illinois-Iowa)

2) AQCR 068 - Metro Dubuque Interstate (Iowa-Illinois-Wisconsin)

3) AQCR 069 - Metro Quad Cities Interstate (Illinois-Iowa)

4) AQCR 085 - Metro Omaha - Council Bluffs Interstate (Iowa-Nebraska)

5) AQCR 086 - Metro Sioux City Interstate (Iowa-Nebraska-South Dakota)

6) AQCR 087 - Metro Sioux Falls Interstate (S. Dakota-Iowa)

7) AQCR 088 - North East Iowa

8) AQCR 089 - North Central Iowa

9) AQCR 090 - North West Iowa

10) AQCR 091 - South East Iowa

11) AQCR 092 - South Central Iowa

12) AQCR 093 - South West Iowa

The locations of these 12 AQCR's are shown in Figure A-1. For the sake of brevity, discussions in the body of this report will combine Iowa's AQCR's where appropriate. Ambient Air Quality Standards in Iowa are identical to the federal standards (Table A-3).

Table A-1 lists the original priority classifications of Iowa's AQCR's. As might be expected, Iowa AQCR's having urban centers and/or high population are classified Priority I for particulates. All Iowa AQCR's except 065 (Burlington) and 085 (Omaha) are classified Priority III for SO_2.

Iowa has designated counties in five AQCR's (065, 068, 069, 088 and 092) as AQMA's for TSP. No AQMA designations have been made for SO_2 (or NO_x) in Iowa's AQCR's. The expected attainment dates for NAAQS are shown in Table A-2.

2.2 AIR QUALITY MONITORING - (See Table A-4 and A-5)

All of Iowa's AQCR's appear reasonably well monitored for TSP relative to population (Table A-1) and emission density. AQCR 065 (Burlington Interstate), AQCR 086 (Metro Sioux City Interstate), and the non-urban AQCR's 090 (N.W), 091 (S.E.), and 093 (S.W.) have the smallest number of hi-volume TSP samplers. Iowa has reporting SO_2 monitors in eleven of twleve AQCR's. AQCR 091 (S.E.) does not have a monitoring station which reports to the SAROAD data bank. Only AQCR 092 (S.C.) appears well monitored for SO_2, however, and most of Iowa's SO_2 data is from 24 hour bubblers.

2.3 SUSPENDED PARTICULATE LEVELS IN IOWA

Table A-4 shows reported violations of the federal secondary TSP standards in all of Iowa's AQCR's except 091 (S.E.). Further, violations of both the annual geometric mean and the 24 hour maximum standards are common. The annual and 24 hour primary federal TSP standards are also violated in at least five of Iowa's 12 AQCR's (many monitors had insufficient data for computation of annual geometric mean). Although fugitive dust probably contributes to atmospheric particulate loadings in Iowa, the particulate problem seems more than merely localized emission sources or short term NAAQS violations.

Data for the interstate AQCR's of Eastern Iowa, 065 (Burlington), 068, (Dubuque), 069 (Quad Cities) suggest more severe TSP problems in Iowa than in Illinois and Wisconsin. The Western Interstate AQCR data on the other hand, shows the Iowa portions to have slightly lower levels than Nebraska or South Dakota. This rough description may merely reflect, however, the number and relative locations of monitoring stations.

2.4 SO_2 LEVELS IN IOWA

Sulfur dioxide levels in Iowa are well below the federal standards with the 2nd highest 24 hour bubbler concentrations reporting values of about 30% of the federal standard. The small number of SO_2 monitors and measurements, except in AQCR 092 (S.C.), makes spatial description of SO_2 levels difficult. Indeed, some low SO_2 levels in Iowa probably reflect lack of source orientation.

2.5 REVIEW OF IOWA STATE IMPLEMENTATION PLAN

2.5.1 Particulates

Iowa used the example region approach to demonstrate attainment of NAAQS for particulates. A 1968 base year particulate inventory and maximum TSP measurement (Table A-9) in the South Central Interstate AQCR 092 (Des Moines) were chosen for control strategy development. Using a 37 ug/m^3 TSP background value, a 79% linear rollback of emissions was required for NAAQS attainment. Application of particulate control regulations, some of which are listed in Table A-11, was calculated to achieve 81% particulate emission reduction by 1975. Example region regulations were to apply throughout Iowa.

EPA approval of Iowa's example region particulate control strategy was based upon:

- AQCR 092 experiences the highest ambient particulate levels in the State.
- Emission sources in 092 are representative of those throughout the State.
- The most growth was expected to occur in AQCR 092.

Iowa fuel burning regulations currently in effect (Table A-6) apply to all emission sources and allow 0.6 lbs per 10^6 Btu heat input.

2.5.2 SO_2

Iowa used AQCR 065 (Burlington-Keokuk Interstate) as the example region for SO_2. The Illinois portion of AQCR 065 showed a maximum annual average of 107 ug/m^3 (East Peoria, Illinois) for 1970. Linear rollback indicated a 44% SO_2 emissions reduction was required for the entire AQCR. Proposed Iowa SO_2 regulations were calculated to achieve about a 20% SO_2 emission reduction in the Iowa portion of AQCR 065. A gaussian point source diffusion model calculation was performed for major Iowa SO_2 emission source - the Burlington power plant result indicated that a 22% SO_2 emission reduction would be necessary to meet the 24 hour SO_2 standard.

The expected Illinois SO_2 emissions reduction and Iowa's 20% SO_2 emissions reduction was stated to result in a total reduction in AQCR 065 of 66%. EPA approved Iowa's example region plan based on the following:

- Iowa SO_2 sources in AQCR 065 were not major contributors to maximum observed SO_2 levels in Illinois.
- 82% of the inventoried SO_2 emissions originated in Illinois.
- The Illinois Plan demonstrated attainment of NAAQS for SO_2.

Iowa applied fuel sulfur regulations and sulfuric acid plant SO_2 emission regulations statewide, and these regulations were considered adequate to maintain NAAQS in Iowa's non-example AQCR's.

3.0 AQCR ASSESSMENTS BASED ON SIP REVIEW AND CURRENT AIR QUALITY

The purpose of this Section is to examine fuel switching in Iowa's twelve AQCR's and the adequacy of over-restrictiveness of current emission regulations for attaining and/or maintaining ambient air quality standards. Tables A-9 and A-10 are an attempt to assign a regional emissions tolerance for Iowa AQCR's. Appendix B uses this "tolerance," along with such factors as the breadth and depth of air quality violations and percent of emissions resulting from fuel combustion to rate each AQCR as a "good," "Marginal," or "poor" candidate for fuel switching potential and regulation relaxation.

Power plants, industrial sources, and area sources are investigated in Appendices C, D, and E, respectively, for fuel use, emissions, and current regulations. Some calculations of emissions resulting from fuel switching are included for power plants. Appendix F is a rough emissions inventory which could hypothetically result if all fuel burning sources emitted exactly at regulation levels. This inventory is the final test of current regulations relative to air quality.

3.1 CANDIDACY ASSESSMENT FOR FUEL SWITCH POTENTIAL

Tables B-1 and B-2 summarize an initial evaluation of the potential for fuel switching and regulation relaxation for Iowa's 12 AQCR's. All Iowa AQCR's except 091 show violations of NAAQS for TSP. AQCR 091 is rated as a marginal TSP and SO_2 candidate, however, since it appears that few stationary fuel combustion emission sources exist in that region. AQCR 092 (S.C.) is initially rated as a marginal TSP candidate since a SIP to NEDS/SAROAD comparison (Table A-9) suggests that particulate emissions reduction under the SIP might achieve more control than required by NAAQS.

All of Iowa's AQCR's are rated as good candidates for fuel switch/regulation relaxation relative to SO_2. In fact, the State is presently in the process of relaxing the SO_2 regulations for fuel burning sources. These changes are based upon a study which was conducted by the State. The regulation amendments which the State is making would set a 6 lb $SO_2/10^6$ Btu limit to be met by July 1, 1975, and a 5 lb $SO_2/10^6$ Btu limit to be met by July 1, 1978. In addition, the State plans to conduct further studies to determine whether additional regulation relaxation is possible.

3.1.1 AQCRs 087 and 091

AQCRs 087 and 091 report no power plants and few industrial emission sources which can be evaluated for fuel switching potential. Regulation changes in these AQCRs is therefore not especially relevant to either clean fuel savings under ESECA or attainment of NAAQS.

3.1.2 Area Sources

Area emission sources are generally not covered by Iowa SO_2 regulations since such sources are often below the 250 x 10^6 Btu/hour heat input cutoff point. (See regulations in Table A-6).

Table E-2 shows approximate particulate emissions from area sources in Iowa calculated on a lbs/10^6 Btu basis. Aggregated particulate emissions are less than 30% of the Iowa particulate regulation (0.6 lbs/10^6 Btu), reflecting the large percentage of energy supplied by natural gas and oil for Iowa's area sources. A cursory examination of Iowa area sources indicates the following:

- Some coal use occurs for Iowa's area sources and is apparently subject to Iowa particulate regulations.
- Many small area sources probably have little potential for using alternative fuels.
- Even within existing regulations total particulate emissions would increase if gas and oil to coal conversions were to occur for Iowa's area sources.

If Appendix F area source emissions are assumed to remain unaffected by Iowa SO_2 and particulate emissions regulations. This assumption seems reasonable for purposes of examining regulations affecting power plants and industries.

3.2 IOWA SO_2 REGULATION EVALUATION

Since SO_2 levels throughout Iowa are well below NAAQS, AQCRs are not examined separately regarding SO_2 regulation adequacy or over-restrictiveness. Instead, some major qualitative features of Appendices C, D, E, and F are summarized.

- SAROAD SO_2 monitoring data is too limited to allow accurate estimates of additional SO_2 emissions which might be tolerated in Iowa without violating NAAQS.

- Emissions resulting from a switch entirely to coal by all Iowa power plants would exceed total SO_2 emissions allowed by regulations in Eastern AQCRs 065, 068, 069, and southern AQCRs 092, and 093. Tables C-2 indicate even these AQCRs could effect nearly complete coal conversion within the existing SO_2 regulation.

- Aggregated SO_2 emissions are calculated to increase in all Iowa AQCRs (except 091 with reports no power plants) by 20 to 400% if all fuel burning sources were allowed to emit exactly at Iowa SO_2 regulation. Many power plants and industrial sources could, for instance, increase coal use without SO_2 regulation change.

- The only Iowa power plants for which modeling results were available (Burlington - AQCR 065) would apparently violate NAAQS for SO_2 if more emissions than are already allowed by Iowa regulations were to occur. See Table C-1.

- Only in AQCR 093 are total SO_2 emissions from power plants exceeding the amount allowed by the Iowa SO_2 regulation (Tables C-2). The western Iowa AQCRs 085, 086, 089, 090 show power plant emissions to be well below regulations due to natural gas and low sulfur coal use.

- Industrial sources, especially in central and eastern Iowa use some coal at present and could apparently use additional coal without violating Iowa's SO_2 regulations.

The conclusion resulting from the analyses of Appendices C through F is then that all Iowa AQCR's are good candidates for some fuel switching.

3.3 PARTICULATE REGULATION EXAMINATION BY AQCR

AQCR 065

The majority of particulate and SO_2 emissions originate in the Illinois portion of AQCR 065. The only large Iowa power plant in AQCR 065 (Burlington) is currently burning essentially all coal at present (Table C-1).

Since NAAQS for TSP is not currently being met in 065, and total emissions from the Burlington plant and industrial sources (Table D-1) are less than allowed by Iowa particulate regulations, change in the regulation does not seem warrented. Further, the analysis in Table F-2 suggests that emissions allowed under existing regulations may barely be sufficient to attain NAAQS in AQCR 065.

AQCR 068

The Dubuque power plant will apparently require additional emission control over that reported in the NEDS in order to comply with the Iowa particulate regulation. Industrial sources in AQCR 068 appear to have some flexibility in the use of dirtier fuels and still comply with particulate regulation. NAAQS for particulates are currently violated in AQCR 068, however, and the analysis in Table F-1 does not indicate that particulate regulations are overly restrictive in attaining NAAQS. Scrutiny of non-fuel emission sources would be required if relaxation of fuel burning particulate regulation is considered.

AQCR 069

The 3 power plants listed in Table C-1 for AQCR 069 use coal at present for the majority of their heat input. Total particulate emissions from these plants are less than allowed by Iowa regulations Table C-2). A total coal switch in these plants would increase uncontrolled particulate emissions to above the tonnage allowed by Iowa regulations, however.

Industrial sources (Table D-2) could apparently use additional coal within existing Iowa SO_2 regulations, while particulates would require further controls if coal use increased. The ambient TSP levels in AQCR 069 and the analysis in Table F-1 suggest that current Iowa particulate regulations are not overly restrictive.

AQCR 085

The Council Bluffs power plant (Table C-1) uses coal for around 60% of its heat input. This plant could apparently use coal entirely within existing and particulate regulations. Many Iowa industrial emission sources listed in the NEDS are currently burning only natural gas in AQCR 085. Table F-1 indicates that all sources existing at Iowa particulate regulation might result in NAAQS violation for particulates. A similar conclusion was reached for the Nebraska portion of 085 relative to Nebraska particulate regulations.

AQCR 086

Most particulate and SO_2 emissions in AQCR 086 originate in Iowa. Total particulate emissions for four Iowa power plants in AQCR 086 are nearly equal to the tonnage allowed by the Iowa regulation (Table C-1). Table F-1 suggests that fuel switching by power plants and indistrial sources in 086 might result in NAAQS violation within existing particulate regulation.

AQCR 088

Power plants use mostly coal at present in AQCR 088. Total particulate emissions from both power plants and from industrial sources exceed the amount allowed by Iowa regulations. Table F-1 suggests that the existing fuel burning particulate regulation could result in more emissions than required by NAAQS.

AQCR 089

Power plants currently use some coal in AQCR 089. The Iowa particulate regulation could allow more total particulate emission than occur at present from both industrial sources and power plants. Non-fuel particulate emissions appear much larger in the NEDS inventory than fuel emissions in AQCR 089. Control of non-fuel emissions thus appears more important in the attainment of NAAQS. Some fuel switching in AQCR can be expected in 089 within existing particulate regulations.

AQCR 090

Two small power plants in AQCR 090 are listed in Table C-1. Further particulate controls appear necessary at these plants to meet Iowa particulate regulations, especially if all coal use was desired. Since no coal is reportedly used by industrial sources in 090, particulate emissions are below Iowa regulations for this sector. Particulate regulations in AQCR 090 appear consistent with attainment of NAAQS according to the Appendix F analysis.

AQCR 092

AQCR 092 was the Iowa SIP example region for particulates. A small tolerance for increased emissions resulted in Tables A-9 and B-1 when credit was given to controls expected by the SIP. Table F-1, however, suggests that current total particulate emissions from fuel burning sources are essentially the same as the amount which the regulations would allow. Further, emissions allowed by fuel burning regulations alone exceed the tonnage estimated to be required for attainment of NAAQS. Therefore, no particulate regulation relaxation appears justified in AQCR 092.

AQCR 093

The one power plant listed for AQCR 093 burns only coal at present. Industrial sources, on the other hand, burn no coal. The analysis in Table F-1 suggests that fuel burning regulations might be relaxed and still attain NAAQS as non-fuel sources come under control.

3.4 PARTICULATE REGULATION EVALUATION SUMMARY

The AQCR discussions in Section 3.2.4 and the analysis in Appendix F leads to the following conclusion regarding particulate regulation change in Iowa:

- AQCR's 087 and 091 have no significant sources affected by fuel regulations. Change in either SO_2 or particulate regulations would have little impact on NAAQS in these AQCR's. (AQCR 091 is the only Iowa AQCR not to show NAAQS violation for TSP in 1973).

- AQCR's 085, 086, 088, and 092 are very poor candidates for fuel burning particulate regulation relaxation. Significant fuel switching in these AQCR's even within existing regulations could result in emissions exceeding the estimated emissions required for NAAQS attainment.

- Eastern AQCR's 065, 086, 069 and the rural AQCR's 089, 090, and 093. In these AQCR's particulate emissions from fuel burning sources exactly meeting the Iowa particulate regulations could be less than the allowable estimate for NAAQS attainment. The degree of control expected on non-fuel sources thus becomes important for judging NAAQS attainment. AQCR's 068, 090 and 093 appear to be the most likely candidates for fuel particulate regulation relaxation based on the magnitude of reported non-fuel emissions in Table F-1. It must be remembered, however, that NAAQS violations were reported in all of the above AQCR's during 1973.

3.5 IOWA FUEL AVAILABILITY

Table F-3 shows that Iowa produced no gas or oil in 1971, and also produced less coal than was consumed internally. Fuel switching in Iowa would appear to involve fuels from other states.

APPENDIX A

- State Implementation Plan information
- Current air quality information
- Current emissions information

Tables in this appendix summarize original and modified state implementation plan information, including original priority classifications, attainment dates, ambient air quality standards, and fuel combustion emission regulations. SAROAD data for SO_2 and TSP monitoring stations are shown for AQCR's in the State. NEDS emissions data by AQCR[1] are tabulated and broken down into fuel burning categories.

Tables A-9 and A-10 show a comparison of emission inventories in the original SIP and those from the NEDS. An emission tolerance, or emission tonnage which might be allowed in the AQCR and still not violate national secondary ambient air quality standards, is shown for SO_2 and particulates. The intent of this calculation is to indicate possible candidate regions for fuel switching. Tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from more recent data. The value of the emission tolerance provides an indication of the degree of potential an AQCR possesses for fuel revisions and regulation relaxation.

Methodology for Increased Emissions Tolerance

A tolerance for increased emissions was determined as follows. First, an "allowable emissions" was calculated for each AQCR based on the current NEDS data and the percent reduction (or increase) required to meet the national secondary ambient air quality standards in that AQCR (worst case from Tables A-4 and A-5). This "allowable" was then compared to that from the SIP. If reasonable agreement occurred, then the "estimated emissions" which would result after implementation of the SIP in that AQCR was used to calculate an emissions tolerance. Thus, some credit could be given to an AQCR which might be restricting emissions more than required by ambient air quality standards. For instance, emission controls applied to AQCR's

[1] "1972 National Emissions Report," EPA - 450/2-74-012, June 1974.

other than the example region for the state may reduce emissions well below "allowables." In the event that no data existed or was available from the SIP for an AQCR, the current air quality was used to assign emissions tolerance based on proportional rollback or rollup. Current air quality was also the criteria, if emissions data from SIP and NEDS did not appear to be comparable (this is often the case).

When no SIP emissions data was available, and current air quality levels were less than one half of the level represented by an ambient air quality standard, no "rollup" emissions tolerance was calculated in Tables A-9 and A-10. This arbitrary cutoff point was chosen so as not to distort the emissions tolerance for an area. At low levels of a pollutant, the relationship between emissions and air quality is probably not well defined. Although this cutoff may leave some AQCR's with no quantifiable emissions tolerance, it was felt that no number at all would be preferable to a bad or misleading number.

It is emphasized that emissions tolerance is a region-wide calculation. This tolerance obviously makes more sense in, say, an urban AQCR with many closely spaced emissions sources than in a largely rural AQCR with geographically dispursed emissions.

A word of caution regarding particulates needs mentioning. Emission source estimates in the NEDS data bank and most State SIP's are for total particulates. Generally, the control strategies for particulates are aimed at total particulates, while the high-volume particulate sampling (SAROAD data) measures only the finer, suspended fraction. A given level of total particulate emissions control will therefore not translate into the same level of measured ambient air quality. Some of the larger particulates being controlled will not remain suspended, and therefore would not be measured by the high-volume technique. Hence, particulate control plans may have underestimated the amount of control necessary to achieve ambient air quality standards.

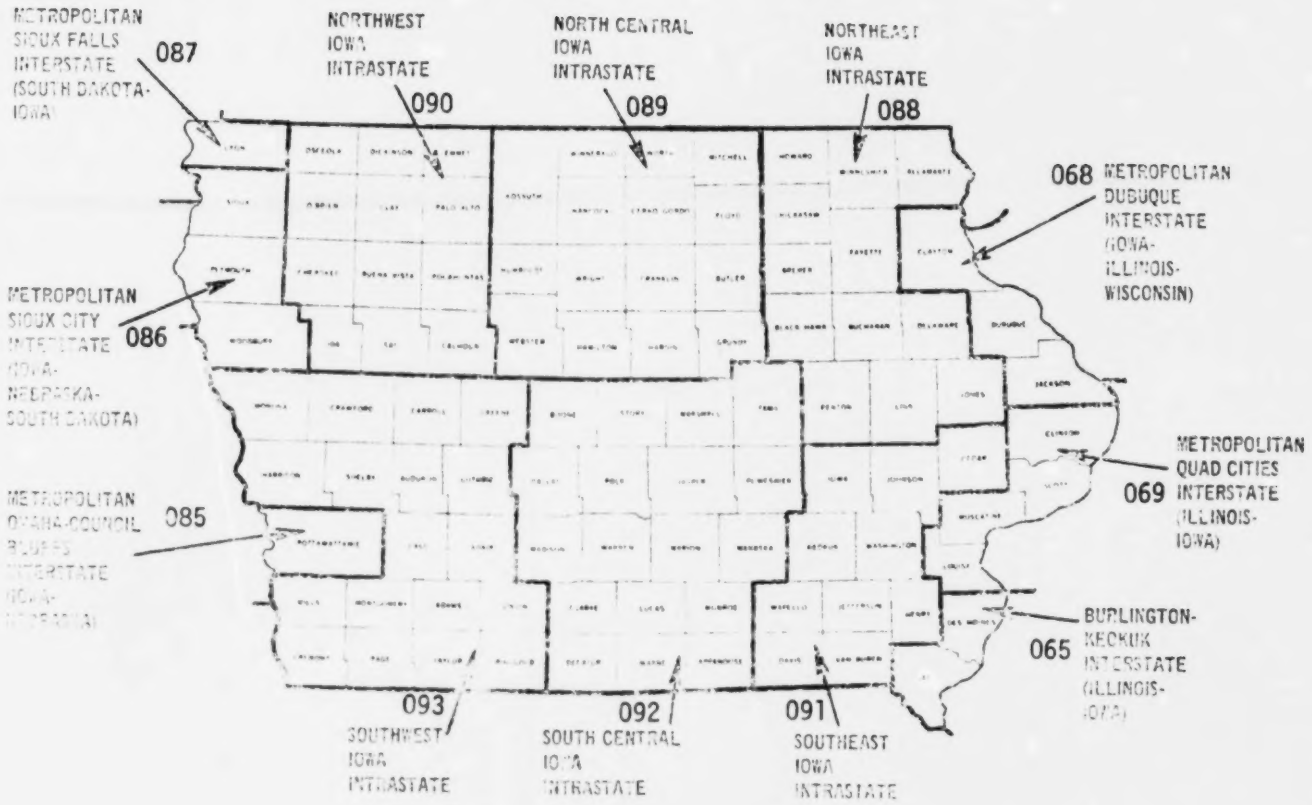

Figure A-1. Iowa AQCR's

Table A-1. AQCR Priority Classification and AQMA's - Iowa

AQCR	Fed. #	Part.[a]	SO_x[a]	NO_x[a]	Demographic Information			Proposed AQMA Designations		
					Population 1970	Square Miles	Population Density	TSP Counties	SO_x Counties	NO_x Counties
Burlington - Keokuk Iowa Illinois	065	1	1	3	89978 551361 641339	935 6245 7180	96.2 88.3 89.3	None 3	None 3	None
Metro Dubuque Iowa Illinois Wisconsin	068	1	3	3	132054 21766 48398 202218	2035 606 1147 3788	65 36 42 53	1	None	None
Quad Cities Iowa Illinois	069	1	3	3	247299 319318 566617	1993 2949 4942	124 108 115	1 2	None	None
Omaha Council Bluffs Iowa Nebraska	085	1	2	3	86991 455655 542646	963 574 1537	90 794 357	1 None	None	None
Sioux City Iowa Nebraska S. Dak.	086	3	3	3	155370 13137 9643 178150	2500 255 452 3207	62 51 21 57	None	None	None
Sioux Falls Iowa S. Dak.	087	2	3	3	13340 124088 137428	588 2576 3164	23 48 43	None	None	None
Northeast	088	1	3	3	492186	7195	68	2	None	None
W. Central	089	1A	3	3	303740	8445	36	None	None	None
Northwest	090	3	3	3	174266	6184	28	None	None	None
Southeast	091	3	3	3	230998	5244	44	None	None	None
South Central	092	1	3	3	664688	10005	66	1	None	None
Southwest	093	3	3	3	234469	10858	22	None	None	None
TOTAL					2,825,041	55941	51			

a) Criteria Based on Maximum Measured (or Estimated) Pollution Concentration in Area

Pollutant	I Greater than	II From - To	III Less than
[b]Sulfur oxide			
Annual arithmetic mean	100	60-100	60
24-hour maximum	455	260-455	260
[b]Particulate matter:			
Annual geometric mean	95	60- 95	60
24-hour maximum	325	150-325	150
[c]Nitrogen dioxide	110		110

[b] Federal Register, August, 1974 SMSA's showing potential for these violations due to growth

Table A-2. Attainment Dates - Iowa

AQCR #	AQCR Name	Particulates		Sulfur Dioxide		Nitrogen Oxides
		Attainment Dates		Attainment Dates		Attainment Dates
		Primary	Secondary	Primary	Secondary	
065	Burlington/Keokuk Interstate	7/75	7/75	7/75	7/75	a
068	Metro Dubuque Interstate	7/75	7/75	a	a	a
069	Metro Quad Cities Interstate	7/75	7/75	a	a	a
085	Metro Omaha-Council Bluffs Inter.	7/75	7/75	a	7/75	a
086	Metro Sioux City Interstate	a	7/75	a	a	a
087	Metro Sioux Falls Interstate	a	7/75	a	a	a
088	N. E. Iowa	7/75	7/75	a	a	a
089	N. Central	7/75	7/75	a	a	a
090	N. W.	a	a	a	a	a
091	S. E.	a	a	a	a	a
092	S. Central	7/75	7/75	a	a	a
093	S. West	a	a	a	a	a

a - already below NAAQS.

Table A-3. Ambient Air Quality Standards - Iowa

(Expressed as $\mu g/m^3$)

		Total Suspended Particulate		Sulfur Oxides			Nitrogen Dioxide
		Annual	24-Hr.	Annual	24-Hr.	3-Hr.	
Federal	Primary	75	260	80	365		100
	Secondary	60	150			1600	
State		SAME AS FEDERAL					

Table A-4. AQCR Air Quality Status (1973), TSP[3] - Iowa

AQCR Name	AQCR #	# Stations Reporting	TSP Concentration (mg/m^3) Highest Reading Annual	Highest Reading 24-Hr.	2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Standards Primary Annual	Primary 24-Hr.	Secondary Annual	Secondary %	Secondary 24-Hr.	Secondary %	% Reduction Required to Meet Secondary Standard (1)	% Reduction Required to Meet 2nd 24-Hr. Standard (2)
Burlington	065												
Iowa		2	40	648	405	0	1	0		2			63
Illinois		1	--	191	184	0	0	0		1			19
		3	40	648	405	0	1	0		3		0	
Metro Dubuque	068												
Iowa		4	--	215	206	0	0	0		2			27
Illinois		0	--	---	---	-	-	-		-			--
Wisconsin		2	31	82	75	0	0	0		2			0
		6		215	206	0	0	0				0	
Quad Cities	069												
Iowa		4	100	292	246	1	0	1		2			39
Illinois		2	---	232	174	-	0	0		2			14
		6	100	292	246	1	0	1		4	67	64	
Omaha Council Bluffs	085												
Iowa		3	---	243	205	-	0	-	--	3			27
Nebraska		12	27	432	316	2	1	4	33	6			53
		15	127	432	316	2	1	4	33	8	53	75	
Metro Sioux City	086												
Iowa		1	50	218	189	0	0	0		1			20
Nebraska		1	90	496	219	1	0	1		1			32
		2	90	496	219	1	0	1		2	100	58	32
Metro Sioux Falls	087												
Iowa		1	27	443	188	0	0	0		1			20
S. Dakota		4	75	370	179	1	0	1		1			16
		5	75	370	188	1	0	1		2	40	40	20
N. E. Iowa	088	12	123	520	403	3	2	3		7	58	73	63
N. C. Iowa	089	4	118	882	502	1	1	1		3	75	72	70
N. W. Iowa	090	2	62	251	180	0	0	1		2	100	8	17
S. E. Iowa	091	1	40	296	144	0	0	0		0	0	0	0
S. Central	092	16	86	972	464	3	4	7		13	80	49	68
S. West	093	2	72	480	144	0	0	1		2	100	34	23

(1) Background on annual geometric mean assumed to be $37 ug/m^3$, the value used in Iowa SIP.
(2) No background assumed on 24 hour Standards.
(3) SAROAD data bank, September 1974.

Table A-5. AQCR Air Quality Status (1973), SO_2 - Iowa

AQCR Name	AQCR #	# Stations Reporting 24-Hr. (Bubbler)	# Stations Reporting (Contin.)	SO_2 Concentration ppb* Highest Reading Annual	Highest Reading 1st 24-Hr.	Highest Reading 2nd 24-Hr.	# Stations Exceeding Ambient Air Quality Std. Primary Annual	Primary 24-Hr.	Secondary 3-Hr	% Reduction Required To Meet Primary 24-Hr. Standard
Burlington Iowa Illinois	085	1 1 2	1 1 2	NA NA NA	162 111 162	66 42 66	0	0	-	0
Metro Dubuque Iowa Illinois Wisconsin	068	2 0 1 3	0 0 – 0	NA -- NA NA	40 -- 11 40	27 -- 10 27	0	0	-	0
Quad Cities Iowa Illinois	069	1 0 1	0 0 0	NA --	31 -- 31	2 - 2	0	0	-	0
Omaha-Council Bluffs Iowa Nebraska	085	1 2 3	0 0 0	NA --	29 31 31	2 27 27	0	0	-	0
Metro Sioux City Iowa Nebraska	086	1 0 1	0 0 0	NA --	2 - 2	2 - 2	0	0	-	0
Metro Sioux Falls Iowa S. Dakota	087	1 0 1	0 0 0	NA -- NA	2 - 2	2 - 2	0	0	-	0
N. E. Iowa	088	1	2	NA	136	79	0	0	-	0
N. C. Iowa	089	1	0	NA	109	83	0	0	-	0
N. W. Iowa	090	1	0	NA	2	2	0	0	-	0
S. E. Iowa	091	0	0	NA	--	--	0	0	-	0
S. C. Iowa	092	10	0	NA	148	105	0	0	-	0
S. W. Iowa	093	2	0	NA	134	94	0	0	-	0

Table A-6. Fuel Combustion Regulations - Iowa

	Existing Sources	New Sources
Particulates	0.8 lbs/10^6 Btu Outside SMSA's (1) 0.6 lbs/10^6 Btu Inside SMSA's (1)	After March 23, 1973 all sources 0.6 lbs/10^6 Btu Power Plants (2) 0.1 lb/10^6 Btu
SO_2	5.0 lbs SO_2/10^6 Btu heat input for solid fuel burning 1.5 lbs SO_2/10^6 Btu Heat Input for liquid fuel burning (Sources > 250 x 10^6 Btu/hr)	Power Plants (2) Oil - 0.8 lbs SO_2/10^6 Btu Coal - 1.2 lbs SO_2/10^6 Btu
NO_x (as NO_2)	Gas - 0.2 lbs/10^6 Btu Oil - 0.3 lbs/10^6 Btu Coal - NO REGULATION (After Jan. 1, 1974)	Power Plants (2) Gas - 0.2 lbs/10^6 Btu Oil - 0.3 lbs/10^6 Btu Coal - 0.7 lbs/10^6 Btu

(1) Standard Metropolitan Statistical Area

(2) Federal New Source Performance Standards, 36 Fed. Reg. 24867, Dec. 26, 1971

Table A-7. Iowa - Emissions Summary, SO_2

AQCR	Total (10^3 Tons/Year)	Percent Fuel Combustion	Electricity Generation		Point Source Fuel Combustion		Area Source Fuel Combustion	
			(10^3 Tons/Year)	%	(10^3 Tons/Year)	%	(10^3 Tons/Year)	%
065 Iowa Illinois	7.0 250.7 257.7	92.0 99.4 99.2	(1) 0 204 204	0 81.3 79.2	5.64 30 35.64	80.6 12. 13.8	.82 15.3 16.12	11.7 6.1 6.3
068 Iowa Illinois Wisconsin	12.5 .02 44.7 58.02	92 93.9 99.8 98.0	7.5 0 43.5 51.0	60.0 0 97.3 87.9	2.9 0 0 2.9	23.2 0 0 5.0	1.1 .77 1.1 2.97	8.8 93.9 2.5 5.1
069 Iowa Illinois	89.4 32.3 121.7	99.0 95.0 97.9	70.2 8.2 78.4	78.2 25.4 64.4	16.9 13.1 30.0	18.9 40.6 24.7	1.4 9.4 10.8	1.6 29.1 8.9
085 Iowa Nebraska	.0 32.3 45.3	92.5 77.2 79.9	7.1 26.2 33.3	88.8 70.2 73.5	0 .7 .7	0 1.9 1.5	.30 1.9 2.2	3.8 5.1 4.9
086 Iowa Nebraska S. Dakota	14.6 .09 .11 14.8	95.5 55.6 45.5 95.0	13.2 0 0 13.2	90.4 0 0 89.2	0.1 0 0 0.1	.69 0 0 .68	.65 .05 .05 .75	4.4 55.6 45.5 5.1
087 Iowa S. Dakota	.165 4.0 4.17	66.1 89.3 88.2	0 2.3 2.3	0 57.5 55.2	0 .6 .6	0 15 14.4	.109 .67 .779	66.1 16.8 18.7
088 (N.E.)	34.4	94.2	16.6	48.3	12.3	35.8	3.5	10.2
089 (N.C.)	21.2	52.8	2.0	9.4	7.3	34.4	1.9	9.0
090 (N.W.)	4.6	82.6	2.7	58.7	0	0	1.1	23.9
091 (S.E.)	4.9	81.8	2.1	42.9	.01	.2	1.9	38.8
092 (S.C.)	83.9	83.0	62.8	74.9	3.0	3.6	3.8	4.5
093 (S.W.)	3.3	70.6	.65	19.7	.08	2.4	1.6	48.5

(1) The Burlington Power Plant in AQCR 065 (Iowa portion) was not accounted for in the 1972 NEDS summary report.

Table A-8. Iowa Emissions Summary, Particulates

AQCR	Total (10^3 Tons/Year)	Percent Fuel Combustion	Electricity Generation		Point Source Fuel Combustion		Area Source Fuel Combustion	
			(10^3 Tons/Year)	%	(10^3 Tons/Year)	%	(10^3 Tons/Year)	%
065 Iowa Illinois	38.0 166.5 204.5	3.2 83.4 68.0	0 (1) 117.1 117.1	0 70.3 57.3	0.95 14 14.95	2.5 8.4 7.3	0.26 7.8 8.06	.68 4.7 3.4
068 Iowa Illinois Wisconsin	10.8 1.1 9.9 21.8	38.0 19.1 97.0 63.7	2.5 0 8.9 11.4	23.1 0 90.0 52.3	1.2 0 0 1.2	11.1 0 0 5.5	0.4 .21 .68 1.29	3.7 19.0 7.0 5.9
069 Iowa Illinois	33.0 18.6 51.6	34.6 48.4 39.6	9.0 2.3 11.3	27.3 12.4 21.9	1.8 1.6 3.4	5.5 8.6 6.6	0.61 5.1 5.71	1.8 27.4 11.1
085 Iowa Nebraska	2.3 15.8 18.1	31.0 80.7 74.5	0.54 12.0 12.54	23.5 75.9 69.3	.003 .100 .103	.13 .63 .57	.170 .654 .824	7.4 4.1 4.6
086 Iowa Nebraska S. Dakota	6.5 .06 .55 7.11	7.7 33.3 5.5 7.8	0.15 0 0 .15	2.3 0 0 2.1	.013 0 0 .013	.2 0 0 .18	.34 .02 .03 .39	5.2 33.3 5.5 5.5
087 Iowa S. Dakota	.25 7.2 7.45	16.4 10.4 10.6	0 .46 .46	0 6.4 6.2	0 .11 .11	0 1.5 1.5	.041 .18 .221	16.4 2.5 3.0
088 (N.E.)	20.4	32.4	4.4	21.6	0.9	4.4	1.3	6.4
089 (N.C.)	48.4	3.6	.54	1.1	.42	.87	.78	1.6
090 (N.W.)	4.0	27.0	.59	14.8	.04	1.0	.45	11.3
091 (S.E.)	9.9	10.5	.34	3.4	.02	.2	.68	6.9
092 (S.C.)	59.0	49.0	27.0	45.8	0.3	.51	1.6	2.7
093 (S.W.)	5.3	25.7	.63	11.9	0.1	1.9	.63	11.9

(1) The Burlington Power Plant in AQCR 065 (Iowa portion) was not accounted for in the 1972 NEDS summary.

Table A-9. Iowa Particulate Required Emission Reductions

AQCR	SIP: AQ Measurement Control Value	SIP: 1968 Emissions (10^3 Tons)	SIP: Allowable Emissions (10^3 Tons)	SIP: 1973 Estimated Emissions After Controls (10^3 Tons)	CURRENT DATA: Percent Reduction Required Based On 1973 AQ Data	CURRENT DATA: 1972 NEDS Emissions (10^3 Tons)	CURRENT DATA: Allowable Emissions (10^3 Tons)	CURRENT DATA: Emission Tolerance (10^3 Tons)
065 Iowa Ill.	AQCR 092 was example particulate region for Iowa. Linear rollback used to demonstrate attainment of NAAQS with Iowa particulate regulations.				63	38 167 205	8.7 38 46.7	0(4)
068 Iowa Ill. Wisc.					27	10.8 1.1 9.9 21.8	7.9 .8 7.2 15.9	0
069 Iowa Ill.					39	33 19 52	20 12 32	0
085 Iowa Nebr.	AQCR 092 was example particulate region for Iowa. Linear rollback used to demonstrate attainment of NAAQS with Iowa particulate regulations.				53	2.3 15.8 18.1	1.1 7.4 8.5	0
086 Iowa (2)					32	6.5	4.4	0
087 Iowa S. Dak.					20	.3 7.2 7.5	.2 5.8 6.0	0
088 Iowa					63	20.4	7.5	0
089	AQCR 092 was example particulate region for Iowa. Linear rollback used to demonstrate attainment of NAAQS with Iowa particulate regulations.				72	48.4	13.6	0
090					17	4.0	3.3	0
091					-4	9.9	10.4	+0.4
092	149 ug/m^3(1)	67.4	14.2	12.9	68	59	18.9	6(3)
093	-	-	-	-	34	5.3	3.5	0

(1) Annual geometric mean 1969, background assumed to be 37 ug/m^3

(2) Most particulate emissions in 1972 NEDS for AQCR 086 originate in Iowa.

(3) Example region 092 show allowable emisstions from SIP and current data to be similar. To the extent that the two data bases are comparable and accurate, a 6000 ton tolenance for increased emissions is indicated.

(4) All AQCR's except example region 092 show no emission tolerance based on current air quality. No information regarding expected degree of control in non-example regions was available.

Table A-10. Iowa SO_2 Required Emission Reductions

SIP					CURRENT DATA			
AQCR	AQ Measurement Control Value	1968 Emissions (10^3 Tons)	Allowable Emissions (10^3 Tons)	1973 Estimated Emissions After Controls (10^3 Tons)	Percent Reduction Required Based On 1973 AQ Data	NEDS Emissions (10^3 Tons)	Allowable Emissions (10^3 Tons)	Emission Tolerance (10^3 Tons)
065 Iowa	107 ug/m^3(1)	50.5	28.3	40.3	0	258	a	-
068	Linear rollback in example SO_2 region 065 did not demonstrate NAAQS attainment. Both a diffusion model and linear rollback after applying Iowa regulations showed −20% reduction ambient SO_2 levels. This reduction combined with the 66% expected reduction in Illinois SO_2 emissions in AQCR 065 were stated to be adequate for attainment of NAAQS.				0	58	a	-
069					0	122	a	-
085					0	45	a	-
086					0	15	a	-
087					0	4	a	-
088					0	34	a	-
089	Linear rollback in example SO_2 region 065 did not demonstrate NAAQS attainment. Both a diffusion model and linear rollback after applying Iowa regulations showed 20% reduction ambient SO_2 levels. This reduction combined with the 66% expected reduction in Illinois SO_2 emissions in AQCR 065 were stated to be adequate for attainment of NAAQS.				0	21	a	-
090					0	5	a	-
091					0	5	b	-
092					0	84	a	-
093					0	3	a	-

(1) Annual arithmetic mean, 1970, monitor located in Peoria, Illinois.

(2) All SO_2 monitoring stations in Iowa report levels well below the SO_2 standards. A rollup of emission is not calculated since unrealistic "allowables" may result.

a) No calculation was made for allowable SO_2 emissions or emissions tolerance in Iowa AQCR's. All monitoring stations report ambient SO_2 levels well below NAAQS. The limited data make the air quality/emissions relationship uncertain in Iowa.

b) No SO_2 data available.

APPENDIX B

Tables B-1 and B-2 are the assessment of AQCR's which should be examined for the fuel switching impact on particulate and SO_2 emissions. They also provide an identification of those AQCR's which show little potential for fuel revision or regulations relaxation if ambient air standards are to be attained.

Those AQCR's designated "good" or "marginal" here will be examined in later appendices where an attempt will be made to estimate the emissions resulting from an assumed fuel schedule different from the present, or the emissions which might result if all fuel burning sources emitted up to their "allowables."

The criteria for candidates are (1) the severity and breadth of air quality violations, (2) the tolerance for emissions increased in the AQCR, (3) the fraction of total emissions resulting from fuel combustion, and (4) AQMA designations. It should be noted that an AQCR may not necessarily need relaxation of regulations in order to accomplish fuel switching. Further, a good candidate in Tables B-1 and B-2 may later show little potential for fuel switching after individual sources are examined. Finally, it is possible that an AQCR may have air quality levels below standard at present ane may require more <u>strict</u> regulations than currently exist if all fuel burning sources were converted to dirtier fuels, i.e., "average" emission rate now may be below "average" regulations.

Table B-1. Candidacy Assessment for Fuel Switch Potential/Regulation Relaxation - Particulates (Iowa only)

AQCR	Air Quality: # Monitors	Air Quality: # Stations Showing Violations	Expected Attainment Date	Total Emissions (10^3 tons)	Any AQMA Designations?	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
065	2	2	7/75	38	No	3	0	Poor
068	4	2	7/75	11	Yes	38	0	Poor
069	4	2	7/75	33	No	35	0	Poor
085	3	3	7/75	2.3	Yes	31	0	Poor
086	1	1	7/75	6.5	No	8	0	Poor
087	1	1	7/75	0.25	[illegible]	16	0	Poor
088	12	7	7/75	20	Yes	32	0	Poor
089	4	3	7/75	48	No	4	0	Poor
090	2	2	b	4	No	27	0	Poor
091	1	0	a	10	No	11	0.4	Marginal
092	16	13	7/75	59	Yes	49	6	Marginal
093	2	2	b	5.3	No	26	0	Poor

[a]Already below standards.

[b]SAROAD data indicates 24 hour standard violations in AQCR in 1973; earlier data had indicated that AQCR's 093 and 090 were below NAAQS for TSP.

Table B-2. Candidacy Assessment for Fuel Switch Potential/Regulation Relaxation - SO_2 (Iowa only)

AQCR	Air Quality: # Monitors	Air Quality: # Stations Showing Violations	Attainment Date	Total Emissions (10^3 tons)	Any AQMA Designations?	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
065	2	0	a	7	No	92	a	Good
068	2	0	a	13	No	92	a	Good
069	1	0	a	89	Yes	99	a	Good
085	1	0	a	8	No	93	a	Good
086	1	0	a	15	No	96	a	Good
087	1	0	a	.2	No	66	a	Good
088	3	0	a	34	No	94	a	Good
089	1	0	a	21	No	53	a	Good
090	1	0	a	5	No	83	a	Good
091	0	0	a	5	No	82	-	Good
092	10	0	a	83	No	83	a	Good
093	2	0	a	3	No	71	a	Good

[a]Already below NAAQS, exact allowable SO_2 emissions undefined.

APPENDIX C

This section is a review of individual power plants by AQCR. The intent is to illustrate: (1) current SO_2 and particulate emissions, (2) fuel switching possibilities, and (3) allowed emissions for power plants based on current regulations. The total AQCR emissions resulting from possible fuel switches is then calculated.

Current power plant information used to prepare Table C-1 was obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association "Steam Tables" listing of power plants and fuel use in 1972, and (3) NEDS Emissions data.[1] For those plants listed by the FPC (1 above), the 1973 fuel schedule was assumed, otherwise, fuel use is for 1972. Heat inputs are those based on actual fuel values where known, and average values shown in Table C-3 were used where not known. SO_2 and particulates emissions are those associated with the fuel use shown. In the case of particulates, emissions were calculated using NEDS emissions factors applied to the listed fuel schedule (in both tonnage and $lbs/10^6$ Btu). When a plant was not listed in NEDS, AP-42 emission factors were used to estimate SO_2 and particulate emissions (see Table C-3).

Table(s) C-1 also lists allowable emissions calculated by applying current regulations (Table A-6) to the gross heat input to each plant. The Iowa particulate and SO_2 regulations were assumed to apply to all power plants regardless of size. Since Iowa's SO_2 regulations are different for oil and coal use, allowable SO_2 emissions were calculated assuming a switch to coal where possible, and a switch from gas to oil otherwise.

Totals of fuels, current emissions, and allowable emissions are calculated for each AQCR at the bottom of Table(s) C-1 and are shown again in Tables C-2 for comparison after fuel switch. Plants are switched entirely to coal where possible and to "all oil" if a plant cannot use coal. The fuel switch calculations are intended to show the magnitude of emissions increase accompanying a

[1] NEDS data bank, December 1974.

fuel switch without additional controls. The exact emissions would depend upon actual fuel mix, amount of sulfur in fuels, and degree of emissions controls accompanying a fuel switch.

It might be cautioned that AQCR total emissions calculated in the tables of Appendix C (and also Appendix D) may not agree exactly with total emissions represented in Appendix A (Tables A-7, A-8). This is a result of both differing fuel schedules in 1973 compared to previous years and the relative "completeness" of the NEDS data bank. Along the same line, AQCR totals may contain a "mix" of 1972 and 1973 fuel schedules (and resulting emissions). The intent of the listings is not great precision, but rather to show approximate status relative to regulations at present, and to show results of fuel switching where possible.

Table C-1. Power Plant Characterization

County	Plant Name	Fuel Use * Type, % Sulfur, % Ash	Annual * Quantity	Heat Input (10^6 Btu/hr)	Emissions SO_2 Existing tons/yr	SO_2 Existing lbs/10^6 Btu	SO_2 Allowable tons/yr	SO_2 Allowable lbs/10^6 Btu	Particulates Existing tons/yr	Particulates Existing lbs/10^6 Btu	Particulates Allowable tons/yr	Particulates Allowable lbs/10^6 Btu
AQCR 066												
Des Moines	Burlington 212 MW	Coal 2.62%S 8.2 %A	447	1047	22764	4.96	22951	5.0	440	0.10	2754	.6
		Oil 1%S	0.98	0.65	3				-			
				1048								
		Walden model of Burlington Plant indicates that 3.0% sulfur coal could be used and still attain NAAQS. This regulation would allow 2.7% sulfur coal. See reference 18										
	TOTALS	Coal	447	1047								
		Oil	0.98	0.65								
		TOTAL		1048	22767	4.96	22951	5.0	440	0.10	2754	0.6
AQCR 068												
Dubuque	Dubuque 9125 MW	Coal 2.92%S 10. 5%A	107	265	6045				3500			
		Oil 0.4% S	2.24	1.5	3	3.02	10008	5.0	--	1.75	1201	0.6
		Gas	1662	190	--				12			
				457								
		Coal	107	265								
		Oil	2.24	1.5								
		Gas	1662	190								
		TOTAL		456.5	6048	3.02	10008	5.0	3512	1.76	1201	0.6

* Coal - 10^3 tons
Oil - 10^3 bbls
Gas - 10^6 ft^3

Indicates that a plant has heat input less than 250×10^6 Btu/hr.

Table C-1. Power Plant Characterization

County	Plant Name	Fuel Use *			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type & Sulfur & Ash	Annual Quantity	Heat Input $\times 10^6$ Btu/hr	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
AQCR 069 Clinton	Kapp 237.2 MW	Coal 3.0%S 10.5%A	465	1198	27079	5.08	26674	5.0	635 --	0.12	3201	0.6
		Oil 0.4%S	0.42	0.28								
		Gas	170	19.4 / 1218	--				--			
Scott	Riverside 222 MW	Coal- 2.4%S 9. 7%A	569	1417	27499	3.21	42880	5.0	6240	0.73	5146	0.6
		Gas	3948	451 / 1868	1				30			
Muscatine	Muscatine 118 MW	Coal 3.2%S 9.5%A	81	203	4930	3.41	7840	5.0	1700	1.09	941	0.6
		Gas	1364	155 / 358	--				2			
		Coal	1115	2818								
		Oil	0.42	0.28								
		Gas	5412	625								
		TOTAL		3443	59510	3.95	77394	5.0	8607	0.57	9288	0.6
AQCR 085 Potto Wattamie	Council Bluffs 130.6 MW	Coal 0.94%S 8. 8%A	207	480	3781	1.34	16622	5.0	113	0.04	1995	0.6
		Oil	0.33	.22	1				---			
		Gas	2431	279 / 759	1				18			
		Coal	207	480								
		Oil	0.33	0.22								
		Gas	2431	279								
		TOTAL		759	3783	1.14	16622	5.0	131	0.04	1995	0.6

Table C-1 Power Plant Characterization

County	Plant Name	Fuel Use *			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
AQCR 086 Woodbury	Big Sioux 40 MW	Oil 0.18%S	13.5	8.95	8	0.02	1034	1.5*	2	0.02	413	0.6
		Gas	1293	148 157	-				10			
	George Neal 496 MW	Coal 0.82% S 10.7% A	1072	2461	17063	1.29	66116	5.0	7300	0.55	7934	0.6
		Oil 1% S	1.94	1.3	6				-			
		Gas	4883	557 3019	1				36			
	Kirk (Sioux City)	Coal	0									
		Oil 1% S	75	48	247	0.43	2869	1.3 5.0*	13 5	0.03	344	0.6
		Gas	725	83 131	-							
	Storm Lake	Coal 3.25% S 9.4% A	8.8	24	543	1.82	1489	5.0*	662	2.23	179	0.6
		Gas	372	44 68	-				3			
		Coal	1081	2485								
		Oil	90.4	58.3								
		Gas	7273	832								
		Total		3375	17868	1.21	71505	5.0	8031	0.54	8870	0.6

Table C-1. Power Plant Characterization

County	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
AQCR 088												
Linn	Sixth Street 92.2 MW	Coal 2.36% S 7.6% A	223	532	10220				1300			
		Oil 1% S	2.16	1.45	7	3.60	14191	5.0	-	0.46	1702	0.6
		Gas	1010	115	-				1			
		[Furfural Residue]	66 x 10^3 tons	unknown 648	-				-			
	Prairie Creek #4 148.7 MW	Coal 2.46 % S 8.4% A	471	1176	22501				5140			
		Oil 1% S	1.17	0.8	4	4.16	17047	5.0	-	0.95	3246	0.6
		Gas	515	58.8 1235	-				4			
	Prairie Creek # 1-3 96 MW	Gas	1411	161	-	-	1058	1.5*	11	0.02	423	0.6
Allamakee	Lansing 64.0 MW	Coal 2.99% S 10.5% A	114	292	6625	5.18	6394	5.0	7700	6.02	767	0.6
		Oil 0.4% S	0.30	0.2 292	-				-			
Black Hawk	Maynard 100 MW	Coal 2.88% S 9.4% A	93.9	237	5252	1.84	14432	5.0	3500	1.22	1732	0.6
		Oil	1945	13	63				3			
		Gas	3581	409 659	1				27			
	Iowa Falls	Coal 2.3% S 8.8% A	16.7	42	731	2.11	1730	5.0*	236	0.69	208	0.6
		Gas	327	37 79	-				2			
		Coal	919	2279								
		Oil	23.1	15.5								
		Gas	6844	781								
		Total		4075.5	45404	1.37	54852	4.07	17924	1.33	8078	0.6

Table C-1. Power Plant Characterization

County	Plant Name	Fuel Use *			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
AQCR 089 Cerro Gordo	Mason City 23.5 MW	Coal Oil 2.8% S Gas	0 33 1000	0 21 114 135	304 -	0.51	2057	5.0*	6 8	0.02	355	0.6
Hamilton	Webster City 37.9 MW	Coal 3.91% S 5.8% A Gas	6 30	17.1 2.3 20	446 -	5.09	438	5.0*	90 -	1.02	53	0.6
	Humbolt 41 MW	Coal 2.2% S 7.4% A Gas	25.6 483	64.1 55.1 119	1072 -	2.06	2606	5.0*	171 4	0.34	313	0.6
		Coal Oil Gas	31.6 33 1513	81.4 21.0 172.4								
		Total		274.8	1822	1.51	6001	5.0	279	0.23	721	0.6
AQCR 091 Clay	Spencer 12.5 MW	Coal 0.8% S 5.5% A Oil 0.3% S	1.1 23.8	2.76 16.0 19	17 -	0.20	416	5.0*	51 7	0.70	50	0.6
	Carroll 10 MW	Coal (2) 2.5 S 10.3% A Gas	6 298	14 35 50	285 -	1.63	876	5.0*	480 2	2.75	105	0.6
		Coal Oil Gas	7.1 23.8 298	18.8 16.0 34								
		Total		68.8	302	1.0	1292	5.0	540	1.78	155	0.6

Table C-1. Power Plant Characterization

County	Plant Name	Fuel Use *			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
AQCR 092												
Boone	Boone 34.2 MW	Coal 2.8% S 10.0% A	20.5	49.2	1115	0.96	5804	5.0	800	0.70	696	0.6
		Oil 2% S	0.16	0.1	1				-			
		Gas	1854	216 265	-				14			
Marshall	Sutherland 156.6 MW	Coal 2.8% S 11.7% A	176.5	417.	9597	1.64	29324	5.0	790	0.15	3519	0.6
		Oil 1% S	0.31	.2	1				-			
		Gas	8076	922 1330	2				61			
Polk	Des Moines 325 MW	Coal 2.93% S 10.0% A*	456	1007	25932				9060			
		Oil 0.4% S	3.44	2.3	4	2.56	50655	5.0	1	0.90	6079	0.6
		Gas	11427	1304 2313	3				86			
Monroe	Bridgeport 71 MW	Coal 2.71% S 10.0 % A(2)	183	422	9423	4.88	9702	5.0	14640	7.55	1164	0.6
		Oil 1%	16.1	10.8 433	52				3			
	Pella	Coal 4.8% S 17.7% A	27	67.8	2460				62			
		Oil 0.5% S(2)	5286	3548	8714	0.49	114187	5.0		0.05	13702	0.6
		Gas	14000	1598 5214	4				888 105			

(2) Assumed, No % S or % A information available where indicated.

Table C-1. Power Plant Characterization

County	Plant Name	Fuel Use *			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
AQCR 092 (cont'd) Story	Ames	Coal 4.5% S 12.5% A	42.4	91.9	3615	282	6504	5.0	100	0.08	781	0.6
		D. Oil 0.5% S	32	21.5	48				4			
		Gas	1602	183 297					-			
		Coal Oil Gas	905 5338 36959	2055 3583 4223								
		Total		9861	60971	1.41	216176	5.0	26604	0.62	25941	0.6
AQCR 093 Union	C.I. Power 22.5 Mw	Coal 3.5% S 7.5% A	27	67.8	1783	6.0	1485	5.0*	790	2.66	178	0.6
		Coal	27	67.8	1783	6.0	1485	5.0	790	2.66	178	0.6

Table C-2. Iowa Power Plant Summary

AQCR	Fuel	Present Use Quantity	Present Use 10^9Btu/y	Gas & Oil to Coal Quantity	Gas & Oil to Coal 10^9Btu/y	Emissions tons/yr Present	Emissions tons/yr Oil & Gas To Coal	Lbs/10^6 Btu Present	Lbs/10^6 Btu Oil & Gas To Coal	Allowable Emissions tons/year	Allowable lbs/10^6 Btu
065	Coal	447	9172	447	9178						
	Oil	0.98	6.3	0	0						
	Gas	0	0	0	0						
			9178		9178						
	SO_2					22767	22780	4.96	4.96	22951	5.0
	Particulates					440	440	0.1	0.1	2754	0.6
068	Coal	107	2321	184	4003						
	Oil	2.24	19.6	0	0						
	Gas	1664	1662	0	0						
			4003		4003						
	SO_2					6048	10426	3.02	5.21	10008	5.0
	Particulates					3512	6036	1.76	3.03	1201	0.6
069	Coal	1115	9767	1740	10250						
	Oil	0.42	3.7	0	0						
	Gas	5482	5477	0	0						
			10250		10250						
	SO_2					59510	92915	3.95	6.17	77394	5.0
	Particulates					8607	13389	0.57	0.89	9288	0.6
085	Coal	207	4205	327	6651						
	Oil	0.33	1.9	0	0						
	Gas	2431	2444	0	0						
			6651		6651						
	SO_2					3783	5980	1.14	1.80	16622	5.0
	Particulates					131	179	0.04	0.05	1995	0.6
086	Coal	1081	21769	1468	29568						
	Oil	90.4	511	0	0						
	Gas	7273	7288	0	0						
			29568		29568						
	SO_2					17868	23914	1.21	1.62	71505	5.0
	Particulates					8031	10814	0.54	0.73	8870	0.6

Table C-2. Iowa Power Plant Summary

AQCR	Fuel	Present Use Quantity	Present Use 10^9Btu/y	Gas & Oil to Coal Quantity	Gas & Oil to Coal 10^9Btu/y	Emissions tons/yr Oil & Gas Present	Emissions tons/yr Oil & Gas To Coal	Lbs/10^6 Btu Oil & Gas Present	Lbs/10^6 Btu Oil & Gas To Coal	Allowable Emissions tons/year	Allowable lbs/10^6 Btu
088	Coal	919	19964	1240	26941						
	Oil	23.1	135.8	0	0						
	Gas	6844	6481.6	0	0						
			26941		26941						
	SO_2					45404	61171	3.37	4.54	54852	4.07
	Particulates					17924	24124	1.33	1.79	8078	0.6
089	Coal	31.6	713.1	107	2407						
	Oil	33.0	184	0	0						
	Gas	1513	1510.2	0	0						
			2407		2407						
	SO_2					1322	5125	1.51	4.25	6001	5.0
	Particulates					279	881	0.23	0.73	721	0.6
090	Coal	7.1	164.7	26	603						
	Oil	23.8	140.2	0	0						
	Gas	298	297.8	0	0						
			603		603						
	SO_2					302	1105	1.0	3.66	1292	5.0
	Particulates					540	1943	1.79	6.44	155	0.6
092	Coal	905	18002	4143	86382						
	Oil	5338	31387	0	0						
	Gas		36993	0	0						
			86382		86382						
	SO_2					60971	250202	1.41	5.79	216176	5.0
	Particulates					26604	122083	0.62	2.85	25941	0.6
093	Coal	27	593.9	27	593.9						
	Oil	0	0	0	0						
	Gas	0	0	0	0						
			593.9		593.9						
	SO_2					60971	250202	1.41	5.79	216176	5.0
	Particulates					790	790	2.66	2.66	178	0.6

Table C-3. AP-42 Power Generation Emission Factors

Fuel	Particulates Lbs/Ton	Particulates Lbs/10^6 Btu	SO_2 Lbs/Ton	SO_2 Lbs/10^6 Btu	Hydrocarbons Lbs/Ton	Hydrocarbons Lbs/10^6 Btu	NO_x (as NO_2) Lbs/Ton	NO_x (as NO_2) Lbs/10^6 Btu
Coal(1) (Bit.)								
General	160	7.4			0.3	0.013	18	0.78
Wetbottom 10% A	130	7.0					30	1.3
Cyclone	20	0.9					55	2.4
1% S	Same	Same	38	1.65	0.3	0.13	Same	Same
2% S	as	as	76	3.3			as	as
3% S	Above	Above	114	5.0			Above	Above
Oil(2)	Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal	
0.5% S	8	0.058	79	0.56	2	.014	105	0.75
1.0% S	8	.058	157	1.12	2	.014	105	0.75
2.0% S	8	.058	314	2.24	2	.014	105	0.75
Gas(3)	Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3	
(.3 lbs S/ 10^6 Ft^3)	15	.015	0.57	.00057	1	.001	600	0.60

(1) Coal 23 x 10^6 Btu/Ton
(2) Oil 140 x 10^3 Btu/Gal
(3) Gas 1000 Btu/Ft^3

APPENDIX D

The Tables D-1 in this appendix list individual industrial/commercial/institutional sources of particulates and SO_2 emissions which might show fuel switching potential. The sources are from a NEDS rank order emissions listing. Tables D-1 account for at least 95% of a total emissions (both fuel and non-fuel sources) in the AQCR, since not all industrial sources could be listed in this report. It should be cautioned that the percent emissions accounted for is different than the "% of fuel use accounted for." It is possible that several potential fuel switch sources could be overlooked by the cutoff point on the emissions (i.e., a reasonable sized natural gas used may emit below our cutoff point in the NEDS rank order list).

All sources listed were assumed to be affected by Iowa SO_2 and particulate regulations, and "allowable" emissions for SO_2 were calculated by applying the appropriate SO_2 regulation (Table A-6) to the fuels currently in use.

Fuel switch emissions calculations were not made for industrial sources, since no information was available for feasibility of <u>any</u> fuel switching. Summary Table D-2 lists current fuels and emissions for each AQCR along with the aggregated emissions which would be allowed by existing regulations.

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name	Type & Sulfur & Ash	Annual Consumption	Heat Content	SO2 Emissions				Particulates Emissions			
					Existing		Allowable		Existing		Allowable	
									lbs/10^6 Btu	Tons/Year	lbs/10^6 Btu	Tons/Year
AQCR 065												
1200	Army Ammunitions Plant	Coal 2.6% S 11.3% A	29,000	82.8	1430	3.61	2190	5.0	974	2.25	263	0.6
		R. Oil 1.8% S	1,021	17.5/100	150				11			
2240	Hubinger Co.	Coal 3.0% S 13.6% A	62,600	779	3570	3.27	5475	5.0	52	0.05	657	0.6
		D. Oil 0.3% S	522	8.9	13				4			
		Gas	517	62.0/250	-				4			
2240	Chevron Chemical	Gas	6,767	772	2	-	5072	1.5	59	0.02	2029	0.6
	TOTAL	Coal	91,600	261.8								
		Oil	1,543	26.4								
		Gas	7,284	834								
				1122.2	5165	1.05	12737	2.59	1104	0.22	2948	0.6
AQCR 068												
1280	Celotex Corp.	Coal 1.74% S 8.9% A	5,200	14.8	172	0.61	1402	5.0	116	0.43	168	0.6
		Gas	433	42.4/58	-				4			
	Dubuque Packing	D. Oil	1,436	21.3	31	0.07	590	1.5	11	0.04	276	0.6
		Gas	734	83.7/196	-				7			
	John Deere	Coal 3.4% S 10.7% A	33,760	88.6	2240	1.95	5738	5.0	204	0.19	689	0.6
		Gas	1,521	173/262	-				14			
	TOTAL	Coal	38,960	103.4								
		Oil	1,438	21.3								
		Gas	2,688	306.1								
		Total		430.8	2443	1.29	7830	4.15	356	0.19	1133	0.6

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name	Fuel Type & Sulfur & Ash	Fuel Throughput	Fuel Throughput	Emissions Factor	Emissions Factor	Emissions Factor	Emissions Factor	Particulate Emissions	Particulate Emissions	Allowable
AQCR 069											
940	Corn Processing Co.	Coal 2.6% S 6.0% A	175,720	421	11012				3133		
		D. Oil 0.5% S	3,429	56.8	120	4.11	13556	5.0	73	1.19	1627	0.6
		Gas	1,260	143 578	-				11			
2740	Grain Processing Corp.	Coal 2.63% S 8.1% A	22,280	53.4	1113				509			
		Gas	4,516	515 568	1	0.45	12439	5.0	41	0.22	1493	0.6
940	Nat. By-Prod.	D. Oil	730	10.8	19	0.40	71	1.5	5	0.11	28	0.6
	TOTAL	Coal	198,000	474.4								
		Oil	4,159	65.6								
		Gas	5,775	658								
		Total		1,198.0	12265	2.34	26,064	4.97	3,772	0.72	3148	0.6
AQCR 085												
3140	Griffin Pipe Prod	Gas	376	42.9	-	-	282	1.5	3	0.02	113	0.6
	American Beef	Gas	345	39.4	-	-	259	1.5	3	0.02	103	0.6
	Frito-Lay, Inc.	Gas	99	11.3	-	-	74	1.5	1	0.02	30	0.6
	TOTAL	Coal	-	0								
		Oil	-	0								
		Gas	820	93.6								
		Total		93.6	-	01	615	1.5	7	0.02	246	0.6

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name	Type & Sulfur & Ash			Particulates						
					Existing		Allowable		Existing		Allowable
									lbs/hr		lbs/hr
AQCR 086											
4020	Esmark Swift	R. Oil 2.0% S	520	8.90	82	2.10	217	1.5	6	0.06	87	0.6
		Gas	212	24.2 / 33	-	-			2			
	Terra Chem	Gas	4333	495	1	-	3252	1.5	40	0.02	1300	0.6
	Winco Div.	D. Oil 0.3% S	186	2.80	4	0.33	131	1.5	1	0.02	53	0.6
		Gas	152	17.4 / 20	-	-			1			
	TOTAL	Coal	-	0								
		Oil	706	11.7								
		Gas	4697	536.6								
		Total		548.3	88	0.04	3600	1.5	50	0.02	1440	0.6
AQCR 088												
2280	Renick & Ford	D. Oil 0.5% S	5,330	85.2	189	0.21	1360	1.5	6		544	0.6
		Gas	1,073	122 / 207	-				-			
	Wilson Co.	Coal 2.2% S 6.6% A	22,400	61.4	935	1.96	2387	5.0	938	1.97	286	0.6
		Gas	421	48.1 / 109	-				3			
340	John Deere Waterloo	Coal 3.0% S 8.0% A	50,275	132	2865	4.96	2891	5.0	1397	2.41	347	0.6
	Rath Packing	Coal 2.88% S 6.8% A	36,074	103	2262	2.65	1281	1.5	298	0.35	512	0.6
		Gas	805	21.9 / 195	-				-			
	TOTAL	Coal	108,749	296.4								
		Oil	5,330	85.2								
		Gas	2,299	262								
		Total		643.6	6251	2.22	7919	2.81	2642	0.94	1689	0.6

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual* Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
AQCR 089												
680	N.W. States Port. Cement	D. Oil 2.0% S	1032	15.9	-	-	217	1.5	146	1.01	87	0.6
		Gas	151	17.2 ##	-	-						
3840	Farmland Ind.	Gas	4002	457	1	-	3002	1.5	36	0.02	1201	0.6
	Geo. A. Hormel	R. Oil 2.0% S	386	6.87	61	0.27	142	1.5	1	0.03	137	0.6
		Gas	401	45.8 ##	-				4			
4160	Central Soya	R. Oil 2.5% S	220	3.69	42	0.22	269	1.5	2	0.03	116	0.6
		Gas	344	39.3 ##	-				3			
	TOTAL	Oil Gas	1638 4899	26.1 559.3								
		Total		585.4	104	0.04	3850	1.5	194	0.08	1541	0.6
AQCR 090												
760	Mental Health Inst.	D. Oil 0.5% S	150	3.18	5	0.01	723	1.5	1	0.02	289	0.6
		Gas	537	107 ##	-				3			
	Wilson & Co.	D. Oil 0.5% S	355	4.97	9	0.03	348	1.5	1	0.02	139	0.6
		Gas	420	97.2 ##	-				3			
	John Morrell & Co.	D. Oil 0.42% S	410	6.75	12	0.11	171	1.5	1	0.04	68	0.6
		Gas	169	19.3 ##	-				2			
	TOTAL	Coal Oil Gas	- 860 1526	0 14.94 174.2								
		Total		189.1	25	0.03	1242	1.5	18	0.02	496	0.6

Talbe D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual* Quantity	Heat Input (10^6 Btu/hr)	Tons/yr	lbs/10^6 Btu	Tons/yr	lbs/10^6 Btu	Tons/yr	lbs/10^6 Btu	Tons/yr	lbs/10^6 Btu
AQCR 091 2100	Dexter Co.	D. Oil 3.8% S	43	0.66	9	3.38	4	1.5	-	-	2	0.6
3680	Can-Tex Brick	R. Oil 0.50% S	300	5.14	12	0.53	34	1.5	4	0.17	14	0.6
	John Deere Ottumwa	Coal 4.55% S 10.3% A	17,200	45.2	1490	7.53	990	5.0	443	2.23	119	0.6
	TOTAL	Coal Oil Gas	17,200 343 -	45.2 5.8 0								
		Total		51.	1511	6.76	1028	4.60	447	2.0	135	0.6
AQCR 092 3120	Firestone Tire & Rubber	R. Oil 1.79% S Gas	1757 1258	31.1 144 175	298 -	0.39	1150	1.5	19 11	0.04	460	0.6
	Armstrong Rubber	R. Oil 1.75% S Gas	790 458	13.5 52.3 66	109 -	0.38	434	1.5	9 4	0.05	173	0.6
180	Union Carbide	D. Oil 5.0% S Gas	20 50	0.32 5.7	- -	-	33	1.5	7 -	0.32	13	0.6
1040	Oscar Mayer	D. Oil 1.0% S Gas	234 191	3.74 21.8	34 -	0.30	171	1.5	4 2	0.05	68	0.6
2060	Maytag Company	R. Oil 0.5% S Gas	2854 858	45.4 97.9 143	103 -	0.16	940	1.5	23 6	0.05	376	0.6
	TOTAL	Coal	-	0								
		Oil	5455	94.1								
		Gas	2815	321.7								
		Total		415.8	544	0.30	2728	1.5	86	0.05	1090	0.6

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity	Fuel Use: Heat Input (MMBtu/hr)	SO_2: Existing: lbs/MMBtu	SO_2: Existing: Tons/Yr	SO_2: Allowable: lbs/MMBtu	SO_2: Allowable: Tons/Yr	Particulates: Existing: lbs/MMBtu	Particulates: Existing: Tons/Yr	Particulates: Allowable: Tons/Yr	Particulates: Allowable: lbs/MMBtu
AQCR 093												
3300	Western Engineering	D, 0.1 0.35 S R, 0.1 1.75 S	60 20	9.6 3.4 13	11 3	0.32	65	1.5	-	-	26	0.6
	Western Materials	D, 0.1 0.35 S	56	0.59	1	0.26	6	1.5	-	-	2	0.4
930	Farmland Foods	D, 0.1 0.055 S Gas	500 18	4.8 2.1 7	1 -	0.03	46	1.5	2 -	0.07	18	0.6
	TOTAL	Coal Oil Gas	0 672 18	0 15.4 2.1								
		Total		17.7	16	0.21	117	1.5	2	0.03	46	0.6

Table D-2. Major Industrial Fuel and Emissions Summary - Iowa

AQCR	Fuel Accounted For			SO_2		Particulates	
(Iowa Only)	Coal Tons	10^3 Gal. Oil	10^6 ft^3 Gas	Existing Emissions (Tons)	Allowed Emissions (Tons)	Existing (Tons)	Allowed (Tons)
065	91,600	1,543	7,284	5,165	12,737	1,104	2,949
608	38,960	1,438	2,688	2,443	7,830	356	1,133
069	198,000	4,159	5,775	12,265	26,066	3,772	3,148
085	0	0	820	-	615	7	246
086	0	706	4,697	86	3,600	50	1,440
087	0	0	0	-	-	-	-
088	108,749	5,330	2,299	6,251	7,919	2,642	1,689
089	0	1,638	4,898	104	3,850	194	1,541
090	0	860	1,526	25	1,242	18	496
091	17,200	343	-	1,511	1,028	447	135
092	0	5,455	2,815	544	2,728	85	1,090
093	0	977	18	16	117	2	46
Iowa Total	454,509	22,449	32,820	28,410	67,732	8,677	13,913

APPENDIX E

Table E-1 shows area source fuel use for the State of Iowa by AQCR. The approximate energy values are compared for each fuel along with the percent of overall energy derived from each fuel. Data are those in NEDS as of December 19, 1974. State area source totals are calculated and the percent of energy derived from each fuel shown.

Area source fuel use is then compared to total fuel use in Iowa. The bottom row entitled "all fuels, all sources" may not match totals from Appendices A, C, and D exactly, since neither the NEDS nor individual appendix totals are all-inclusive. Area source fuel use and resulting particulate emissions are calculated on a lbs/10^6 Btu basis in Table E=2.

Table E-1. Area Source Fuel Use - Iowa

AQCR	Coal		Oil		Gas		Total
	Tons	10^9 Btu	10^3 Gals	10^9 Btu	10^6 ft^3	10^9 Btu	10^{12} Btu
065	112670	2591	72460	10300	61240	61240	74.1
068	22520	518	42490	5950	8890	8890	15.4
069	68160	1568	57490	8040	43240	43240	52.8
085	2260	52	48250	6750	44850	44850	51.7
086	3220	74	12090	1810	11760	11760	13.6
087	3550	82	15530	2170	8080	8080	10.3
088	14620	336	50040	7000	28300	28300	35.6
089	7360	169	50860	7120	19450	19450	26.7
090	4070	94	24530	3440	10510	10510	14.0
091	7610	175	26760	3740	12790	12790	16.7
092	18120	417	51890	7260	41270	41270	48.9
093	5960	137	27510	3850	12580	12570	16.6
AQCR TOTALS	270120	6213	479900	67430	305920	305920	376.4
Iowa Only Area Source Totals	77970	1793	317570	44460	171410	171410	217.7
% Fuel Contributions (Iowa Only)		0.8%		20.4%		78.7	100%
Total, all fuels, all sources	5582500	128000	692742	97000	304893	304893	530

Table E-2. Area Source Particulate Emission Estimate

AQCR	Estimated Iowa Area Source Fuel Use (10^{12} Btu/Y)	Iowa Area Particulate Emissions (Tons/Y)	Average (Lbs/10^6 Btu)
065	2.5	260	0.2
068	4.8	400	0.2
069	5.8	610	0.2
085	10.8	160	0.03
086	11.8	340	0.06
088	35.6	1300	0.07
[illegible]	26.7	780	0.06
090	14.0	450	0.06
091	16.7	680	0.08
092	48.9	1600	0.07
093	16.6	630	0.08

APPENDIX F

The Tables F-1 and F-2 illustrate the effect on emissions of particulates and SO_2 when the power plant and industrial fuel burning sources listed in Appendices C and D are allowed to emit up to the amounts that existing regulations would allow. It is assumed that heat input remains the same, and existing regulations are applied to gross heat input for each power plant and industrial source. The column in Table F-1 labeled "Allowable Total Emissions" is the tonnage from Tables A-9 and A-10 which the region can tolerate and still not experience violations of ambient air quality standards. In Table F-2 (SO_2 Evaluation) the analogous column indicates the ratio of the emissions resulting when all sources are emitting at regulations to emissions at present. Allowable emissions for Iowa portions of interstate AQCRs are calculated in proportion to relative emission contributions in the 1972 NEDS.

Area fuel burning sources are assumed to remain unchanged, since Iowa's SO_2 and particulate regulations are not expected to dramatically affect these sources. Non-fuel emission estimates from Tables 7 and 8 of App. A are included in the balance. Since the degree of control which will be achieved on non-fuel particulate sources was not known for this report, the particulate totals serve mainly to show magnitudes relative to tonnage allowed by air quality considerations. For SO_2 the non-fuel estimate would, in many AQCRs, remain about the same due to lack of other SO_2 regulations (except for sulfuric acid plants). Thus the SO_2 "ratio" is not too far from that which would be possible under existing regulations.

A regional approach is implicitly assumed to have some validity in this exercise, so that any conclusions from the numbers in Tables F-1 and F-2 will have to be tempered for AQCRs with widely dispersed emissions.

Lastly, it is emphasized that these tables are hypothetical in that no fuel mix may exist to allow all sources to emit exactly at regulation levels. The calculations do give some insight into the adequacy of existing regulations for allowing air quality standards to be achieved if a fuel schedule different from the one at present were in effect.

A Table F-3 is included in this appendix to summarize gross consumption and production of fossil fuels in Iowa.

Table F-1. Particulate Regulation Evaluation - Iowa

AQCR	10^{12} Btu	Current Allowable Emissions, tons/yr	Regulations lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimate Allowable Emissions for AQCR tons/yr
065 (Iowa)					
Power Plants	9.3	480	0.6	2754	8700 (Iowa only)
Industry	9.8	1104	0.6	2946	
Area Sources	2.5(est.)	250	-	250	
Fuel Total		1834		5950	
Non-Fuel		36800	Unknown	[illegible] uncontrolled	
Total	21.6	38634		42763	
068					
Power Plants	5.2	3812	0.6	1200	7900 (Iowa only)
Industry	3.8	356	0.6	1333	
Area Sources	4.8(est.)	400	-	400	
Fuel Total		4268		2733	
Non-Fuel		6700		6700 (uncontrolled)	
Total	13.8	10968		9433	
069					
Power Plants	30.2	8607	0.6	9288	20000 (Iowa only)
Industry	10.5	3772	0.6	3148	
Area Sources	5.8(est.)	610	-	610	
Fuel Total		12989		13046	
Non-Fuel		21400		21400 (uncontrolled)	
Total	46.5	34389		34446	
085					
Power Plants	6.7	131	0.6	1995	1100 (Iowa only)
Industry	0.8	7	0.6	246	
Area Sources	10.8(est.)	160	-	160	
Fuel Total		298		2801	
Non-Fuel		1590		1590 (uncontrolled)	
Total	18.3	1888		3991	
086					
Power Plants	29.6	8031	0.6	8870	4400 (Iowa only)
Industry	4.8	90	0.6	1440	
Area Sources	11.8(est.)	340	-	340	
Fuel Total		8421		10650	
Non-Fuel		6000		6000 (uncontr [illegible]ed)	
Total	46.2	14421		16650	
087					
Power Plants	~ 0	0	-	9	200 (Iowa only)
Industry	~ 0	0	-	0	
Area Sources	0.2(est.)	41	-	41	
Fuel Total		41		41	
Non-Fuel		210		210 (uncontrolled)	
Total	0.7	251		251	

Table F-1. Particulate Regulation Evaluation - Iowa

AQCR	10^{12} Btu	Current Emissions Tons/yr	Regulations lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimate Allowable Emissions for AQCR tons/yr
088					
Power Plants	35.7	17924	0.6	8078	7500
Industry	5.6	2642	0.6	1689	
Area Sources	35.6	1300	-	1300	
Fuel Total		21866		11067	
Non-Fuel		13900		13900 (uncontrolled)	
Total	76.9	35766		24967	
089					
Power Plants	2.4	279	0.6	721	13,600
Industry	6.1	194	0.6	1541	
Area Sources	26.0	780	-	780	
Fuel Total		1253		3042	
Non-Fuel		46700		46700 (uncontrolled)	
Total	34.2	47953		49742	
090					
Power Plants	0.6	540	0.6	155	1900
Industry	16.5	18	0.6	496	
Area Sources	14.0	450	-	450	
Fuel Total		1008		1101	
Non-Fuel		2900		2900 (uncontrolled)	
Total	31.1	3908		4001	
091					
Power Plants	-	0	-	0	10,400
Industry	0.45	447	0.6	135	
Area Sources	16.7	680	-	680	
Fuel Total		1127		815	
Non-Fuel		8850		8850 (uncontrolled)	
Total	17.3	9977		9665	
092					
Power Plants	96.3	26604	0.6	25941	19,900
Industry	4.8	85	0.6	1090	
Area Sources	46.9	1600	-	1600	
Fuel Total		28289		28631	
Non-Fuel		30000		30000 (uncontrolled)	
Total	148	58289		58631	
093					
Power Plants	0.6	790	0.6	178	3500
Industry	0.35	2	0.6	46	
Area Sources	15.4	630	-	630	
Fuel Total		1422		854	
Non-Fuel		3940		3940 (uncontrolled)	
Total	17.4	5362		4794	

Table F-2. SO_2 Regulation Evaluation

AQCR	10^{12} Btu	Current Emissions tons/year	Reg's lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimated Allowable Emissions for AQCR	Ratio of Emissions at Regulations to Current Emissions
065						
Power Plants	9.3	22764	5.0	22951	Not	1.26
Industry	9.8	5165	1.5-5.0	12373	Calculated	
Area Sources	2.5	820		820		
		28749		36508		
Non-Fuel		560		560 uncontrolled		
Total	21.6	29309		37068		
068						
Power Plants	5.2	6048	5.0	10008	Not	1.88
Industry	3.8	2443	1.5-5.0	7830	Calculated	
Area Sources	4.8	1100		1100		
		9591		18938		
Non-Fuel		1000		1000		
Total	13.8	10591		19938		
069						
Power Plants	30.2	59610	5.0	77398	Not	1.43
Industry	10.5	12265	1.5-5.	26066	Calculated	
Area Sources	5.8	1400		1400		
		73175		104860		
Non-Fuel		894		894		
Total	46.5	74069		105754		
085						
Power Plants	6.7	3783	5.0	16622	Not	3.67
Industry	0.8	80	1.5	615	Calculated	
Area Sources	10.8	300		300		
		4083		17537		
Non-Fuel		600		600		
Total	18.3	4683		18137		
066						
Power Plants	29.5	17868	5.0	31505	Not	4.0
Industry	4.0	96	1.5	3800	Calculated	
Area Sources	11.0	650		650		
		18614		35955		
Non-Fuel		440		440		
Total	44	19264		36395		
087						
Power Plants	-	0		0	Not	
Industry	-	-	-	-	Calculated	
Area Sources	0.2	309	-	309		
Non-Fuel		16				
Total						

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Table F-2. SO_2 Regulation Evaluation

AQCR	10^{12} Btu	Current Emissions tons/year	Reg's lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimated Allowable Emissions for AQCR	Ratio of Emissions at Regulations to Current Emissions
088						
Power Plants	35.7	41404	5.0	54852	Not Calculated	1.14
Industry	5.6	6251	5.0	7919		
Area Sources	35.6	3500	--	350		
		55156		63121		
		2000		2000		
Total	76.9	75156		65121		
089						
Power Plants	2.4	1822	5.0	6001	Not Calculated	1.57
Industry	5.1	104	1.5-5.0	3850		
Area Sources	46.7	1900	-	1900		
		3826		11751		
		10200		10200		
	54.2	14026		21951		
090						
Power Plants	0.6	302	5.0	1292	Not Calculated	1.99
Industry	16.5	25	1.5	1242		
Area Sources	14.0	1100	-	1100		
		1427		3634		
		80		800		
Total	31.1	2227		4434		
091						
Power Plants	-	0	-	0	Not Calculated	0.89
Industry	0.45	1511	1.5-5.0	1028		
Area Sources	16.7	1900	-	1900		
		3411		2928		
		890		890		
Total	17.2	4301		3818		
092						
Power Plants	86.3	60971	5.0	216176	Not Calculated	3.0
Industry	4.8	144	1.5	2728		
Area Sources	44.9	3800	-	1800		
		65315		222704		
		14300		14300		
Total	140	79615		237904		
093						
Power Plants	0.4	1783	5.0	1486	Not Calculated	0.95
Industry	0.15	16	1.5	117		
Area Sources	18.6	1400		1600		
		3199		3203		
		220		220		
Total	17.4	3419		4172		

Table F-3. Energy Statistics* For Iowa 1971

FUEL	PRODUCTION	CONSUMPTION
Coal	9.9×10^5 tons	6.2×10^6 tons
Oil	0	6.4×10^7 BBLS
Gas	0	335×10^8 ft^3

* Energy fact sheet - 1971, U.S. Department of the Interior, Bureau of Mines.

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